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Geological Notes from
Long's Report of Expedition
to Rocky Mountains.
With additions.

Manuscript prepared by
William Hypolyte Keating who
edited the 2nd edition of
the Report.

Notes Vol I

Long's

Expedition

[Relating to Geology.]

Account of an Expedition
from the Pittsburg to the
Rocky Mountains in the
years 1819 & 20 by Majr
Stephen H Long.

Collected Notes June 25 1836.
for Geological application

Page 6 The north western Slope of that range of Mountains known as the Alleganies has a Moderate inclination towards the Bed of the Ohio and St Lawrence which run in nearly opposite directions along its base. This Mountain Chain extends uninterrupted along the attantic Coast from the Gulf of St Lawrence South West to the Great alluvial formation of the Mississipi it Crosses the St Lawrence at the Rapids above Quebec & has been supposed to be Connected as a Spur to a group of primative Mountains occupying a large portions of the interior of the Continent North of the Lakes / Quotes Maclure

our Rivers have their Sources in the Rocky Mountains or on Elevated Spurs of this Range the largest River of the Alleganey is the Ohio

If we consider attentively that extensive portion of our Country Called the Mississipi Valley we shall find it Naturally divided into two

nearly Equal portions This division is made
by a Range of hilly County to be hereafter described
running from near the North western angle
of the Gulf of Mexico North Eastwardly to the
Lake Superior
Though these Rocks (Compact lime Stone and other
secondary) extend almost to the summit of
the alleganies and Belanie even their horizontal
position which they have in the plains the region
they undulate is not to be considered as forming
distinct Table Lands on the Contrary
its surface is Varied by expansive tracts
of Elevated lands 2000 feet above the
attantic. The N W slope of the alegany
though more Gradual than the South Eastern
is like it divided into deep Valleys
parallell with the General Range
The alegany runs nearly parallell but
in an opposite direction to the Ohio
The Great Kanawa in Course above the falls
forms an acute angle with the part
which runs a long distance parallell with
each other & the Ohio
This fact seems to Justify the influence that
some other agent than the Rivers has
been active in the production of the Valleys
between the Subordinate Ridges of the alegany
There appears some reason to believe that the Rocky
hills along the immediate Course of the Ohio
and other large Western Rivers have received at least

their present form from the Agitation of Streams of Water. They do not like the accessory ridges of the Alleghany from high & continuous chains apparently influencing the direction of the rivers, but present Groups of Conical Eminences separated by Water worn Valleys having a Short Synclinic arrangement

The Alleghany on the Western Side is Based either on Metalliferous lime or some of the inclined Rocks belonging to the transition of Werner and have their Summits Capped with More recent Secondary or Flatta without inclination & greatly resembling those found on the Valley of the Ohio. It is not easy to Conceive how Horizontal Strata unless originally Continuous should appear to reindeer at Elevations in different hills Separated by Valleys Several Miles in Width If the Convulsion which produced the inclination of the Metalliferous lime Stone the Clay Slate and Grey Wacke happened before the deposit of the Compact lime Stone & the argillaceous Sandy Why are not these Aggregates found principally in the Valleys where their particles would be supposed most readily to have accumulated

On the other hand if the Secondary Rocks had been deposited previous to the last Supposed Change how have their Stratifications retained the Original Horizontal Position While that of the transition Strata has been Changed.

Page
11 The Allegheny Mountain consists principally of
argillite and Several Varieties of Gray Micke
Gray Wacke Slate which in transition formation
usually intervene between the Metalliferous lime
& the inclined Sand Stone - The Strata have
less inclination in the Bore Sideling and South
Mountain and other Ridges East of the
Alleghany Something of the Inclinity of
the Mississippi extends to the utmost limit
of the Secondary formation.
The Western descent of the Alleghany is more
Gradual than the Eastern and the inclination
of the Strata is reversed in some Measure
It is proper to remark that irregularity of the
Strata in Spurs in direction as well as
the dep of inclination - If any remark is
Generally Applicable it is perhaps that
the inclination is toward the most Elevated
Summits in the Vicinity

12 Laurel Ridge West in Succession is
Separated from the Alleghany by a Wide
Valley The Geological Features are Similar
Similar to those of the Eastern Ranges but
about its Summit the Sand Stones of the Coal
formation begin to appear alternating with
Narrow beds of Bituminous Clay Slate
Near the Summit of the Ridge Coal beds
have been Explored
Thus in Travelling from East to West in the
State of Pennsylvania there is a Constant

last gradual ascent from the Gneiss at Philadelphia
the Primal Rocky Strata occuring one above
another in Successive order of their respective
ages the points most elevated being occupied
by Rocks of most recent origin abounding
in the Remains of animal & Vegetable
life

13 Along the Bottoms of the Alleghany &c
begin to discover Traces of Stone Cement
Rocks so Common in the lower part of
the Valley of the Mississippi the only
Remaining Vestiges of a people once
Numerous & powerful. Of whom time has
destroyed every other Record

11 Protatiferous Lime Stone appears to be the
Sub Stratum of this whole Groupe of Mountains
is again laid Bare in the Vally ~~of the~~
West of the Alleghany

3 & 14 When not overlaid by Clay Slate and particularly
when not in Connection with Sand Stone
the Soils resting on Transition Lime Stone
are found Particularly fertile
The transition Lime is not of frequent occurrence
Westward of the Alleghany Ridge it
appears only in the Vallies is succeeded
by Clay Slate & old Sand Stone lying almost
Horizontal

Coal with the accompanying Strata of argillaceous
Sand Stone & Shale are as far as we have seen
Horizontal

The Alleghany & Monnongahela unite at Pittsburg then course on the margin of Lake Erie a portage of 15 Miles Connects the waters with the St Laurence

Page 15. 100 Miles above Pittsburg near the Alleghany River is a is a Spring on the surface of its waters are found such quantities of Bituminous Oil that several Gallons may be collected in a day.
This Spring is probably Connected with the Coal Strata as are numerous smaller ones in Ohio Kentucky &c

It appears reasonable to declare that the Coal Strata are continued along the whole Western Slope of the Alleghany with little interruption at least as far North as the Bone Springs of Onondago of all the Saline Springs belonging to this formation and whose waters are used for the Manufacture of Salt the most important are those of the Kenhawa a River of Virginia Others occur in that County of Ancient Monuments about Paint Creek Salmon Scioto & the Muskingum, near Silvis Creek Hills in Illinois and indeed in almost all the County Contiguous to the Ohio.
We have usually found argillaceous Sand Stone bearing impressions of Lepidodendra Calamites Ferns &c

Page 16 Where perpendicular shafts are sunk to the depth of from 2 to 400 feet the water when found rises with sufficient force to Elevate its self several feet above the surface of the earth

17 Wheeling at the Base of a Sand Stone Cliff presumed argillaceous

19 2 to 300 Miles below Pittsburg on the Ohio Rocks Grey Sand Stone & Compact Lime The Prevailing Rocks

21 at Cincinatti Compact lime Stone forms
22 the bed of the Ohio The formation of Lime to which this belongs is one of great extent occupying a large part of the County from the Shores of Lake Erie to the South Boundary of the State of Tennessee It abounds in casts & impressions of Marine animals We saw here no Remains of Ammonites Specimens of Lignite found here an Orthocrite in the Collections of Cincinatti Measured near 3 feet in length

P 24 The North of Alleghany forest Found a Sycamore 15 7/10 of a foot in diameter

26 Falls of the Ohio descent 22 ft in 2 miles

27 Direction of the Ohio above and below the Rapids is from N E to S W

Page 28

Silver Creek hills are of Argillaceous Sand Stone and Secondary Clay Slate and the Boiling Spring seems to be placed near the Meeting of two Strata

In the bed of the Ohio opposite Shippingport is a Tabular mass of Rocks Visable above water for the greater part of the Year called Corn Islands on the highest parts yet remain small portions of the Lime Stone Strata Rocks Argillaceous Sand Stone

29 Silver Creek hills are Elevated 150 to 200 feet above the Level of the County in the rear of Jeffersonville they form a North & South range on Kentucky side constitute the commencement of a Rugged and barren District called the Knobs and Extend far to the South at some Remote period this range may have formed a barrier Entirely acros what is now the Valley of the Ohio and retarding the Retreat of the waters above the Falls of Ohio

Coal Occurs in this Range frequently on the North side of the Ohio: Quarries have been opened near the Blue River in the Indiana about the 2 Indyans opposite the mouth of Green River &c

Page
30 The falls of the Ohio are in latitude
38. 15. 23 North

Pipe Stone Branch for Red indurated Clay
Stone such as Indian Pipes are made of

32 Horizontal Lime Stone Cliffs perpendicular
for more 160 feet on the North Bank of
the River at times of High water
the Ohio flows in and falls. The
Cave Rock is its Roof Lime Stone
with impressions and Casts of Shells
of Submarine Animals Organic
Remains do not appear so numerous
as above the falls Remains Consist
Chiefly of Cayophyllae Echinus

33 Fragments of Indian Pottery earthen
heads &c
Near Shawnee town extensive Salt
works

34 Wm Jessups Mineralogical Report
Nitrate of Potash occurs in the caves
of the west
Muriate Soda common Salt
The Springs yielding the Greatest quantity
are those of the Kanawa Little
Mar Franklin Adjoining Boons Saline
Lockets on the Lemone River
250 Gallons Water yield 50 lbs Salt
1000 Yards East of the United States Saline
is a basin or hollow 135 feet in
diameter the Soil in and about blended
with fragments of Earthen Ware.

36 four Miles West of the Salt Place a
Well has been Sunk 60 feet through
the following beds

20 feet through Blue clay at the bottom of
which Salene Spring.
25 feet Similar bed
10 feet a bed of Quick Sand
in which a large Salt Spring
Bones of the Mamoth & other
Animals found in the Clays &
Sand
Strata of Lime in the Cuves.

Cumberland & Tennessee Rivers are many
Miles parallel between them Low
Sand hills but no lofty ranges of
Mountains as have sometimes
been Represented

In Low Ridges North of the Ohio occur
Sand Stone which appears the
Basis Rock often overland with
extensive beds of Pudding Stone
Conglomerate of Various colored
Quartz Cemented with Oxide of
Iron extensive Beds of Compact
Lime also occur in the same
Connection

Near the old deserted Settlement
called Smith land Several Cahokia
Tumuli Shy do not appear to be Natives
37 Ice is seldom found in the Mississippi
so low down as the Mouth of the Ohio

37 4½ Miles above Annuca a Lime Stone Bar called Grand Chain Mississippi has two bars which appear the Continuation of this Chain called big & Little Chain extending across the Point of Land between the two Rivers There Bars are situated 30 Miles above the Ohio a little above Iyawapatia Bottom

There is no Rocky Shore on the Mississippi for thirty Miles above and a far Greater distance below the Mouth of the Ohio Iron Banks 17 Miles below the Mouth Banks 135 feet Composed of alternate Layers of Clay & Sand

Batting Rock Sulphuret of Lead Limestone

Grey plenty Sand Stone extending some distance each Perhaps these Rocks ought to be considered a Spur of the Cumberland

Date 42 The Confluence of the Ohio & Mississippi is in Latitude N

37 22 9

88 5 42 West Greenwich

Lands low about the Mouths Recent Alluvial

About Iyawapatia Near cape La Bruche is a Ledge of Rocks of Lime Placed at the Commencement of the Hilly Country

46 The Painted Rocks Jolliet Marquettes
description

47 The rocks appear to be acted upon
with great rapidity by the Water

49 at the mouth of Kaskaskia on the
Eastern side of the Mississipi Commands
the Celebrated Valley Called the
American Bottom extending
along the Eastern bank of that River
to Prairie Dillis 4 Miles above the
mouth of Missouri Seems the More
recent deposit of the River

50 Fort Charles when Erected by the French
were undermined in part by the
River not long after they were
Erected are now 1/4 of a Mile
from the River
Note of Mr Shultz Fort Charles was
originally built 1/4 of a Mile
from the River was undermined in
1808 { at what date was the fort Erected?
&c

52 30 & 40 Miles South West of Herculaneum
commences the Lead Mines are known
to extend for many Miles through
the Hilly Country at the Sources of
Small Rivers rising in the angle
between the Mississipi & Missouri
below the mouth of the latter River

52 53 + Note of the Public Lands — + Note to Lamentier
55 & Dunn arrived at Vide Poche and 9th
at St Louis

57 The Horizontal Strata of Loess which underlies St Louis in one or two instances has been found to have included impressions of Human feet in possession of Dr Rufus a Stone which has upon its Surface Marks that appear to have been formed by the Naked foot of some human being who was standing upon it while in a plastic State also an irregular line apparently traced by a Stick drawn in the Sand of the same person this Stone was taken from a Slope on the immediate bank of the Mississippi below the Range of the Periodical floods. (Remember the impressions of Recent Leaves brought from Cincinatti by Mendenhall they are annulate gues

58 The Horizontal line has sunk holes or funnels some to very great depth some in diameter from 20 to 50 yards

59 60 61 62 Tumuli Graves of an Ancient people
63. Base 50 feet Height 5 feet oblong Square

Shew of Dr Drakes Collection
Cassis Cornutus Native of Asia
found in an Indian Grave
Near Cincinatti

66 on the Graves of the Indians—
67 The Waters of the Missouri & Mississippi
from 40 Miles unblended in their Course
from the Missouri to Hannibal

68 Shells found in a Section of alluvial
40 feet perpendicular near New Madrid
7 to 8 Layers or deposits they Vary in
thickness from 1/4 to 1 3/4 Inches

70 Carbon air on the Right bank of
the Missouri appearance of Coal
a few feet above the water

79 The left Bank of the Missouri at the
Confluence of Soutie Creek is precipitous
Terminating in a Groupe of Hills
running to the North East Towards
the River Presenting from them summits
high Masses of Rocks have fallen
some of Such magnitude that
their limits are above the surrounding
forest one standing opposite
the Head of the Island next above
Soutie is marked with rude
Drawings executed by the Indians
some representing men with Heads of Bisons
Spears arrows bows &c 1/2 a Mile
above this Rock the Gascounde
enters the Missouri from the South
[Note this Circumstance &c.]

84 Between Soutie Island and Cote
Sans Dessein Compact lime Stone
occurs of a blueish white appearance
somewhat Concoidal in fracture
alternates with Sand Stone having
Siliceous Cement Contains few
Organic Remains

88 Sources of the Arapes River in the
Ozark Mountains opposite those of
White River of the Mississippi and of
the Neosho a tributary of the
Arkansa flowing along the Base
of the North Western Slope of a
Mountainous Range It receives from
the East the Gasconade entering the
Arpage 140 Miles from Missouri

Olite is Carbonate Lime

84 Remains Organic from Dr Lonnfield

Mauvais Rocky

87

88 The Valley of the Missouri pursues
great uniformity of width bounded
on both sides by Chains of Rocky
Bluffs rising from 100 to 200 feet
above the Surface of the included
Valley the river winds from Right
to Left and in many instances
Washes the Bluffs on either side
Opposite the Big Mauvais Rocky
River, is Little Sulfur River. 4
Big Mauvais Creek.

89 The Sight of a town (St Anthony)
at Franklin Numerous Borne Springs
and Boons Licks 12 Miles distant

90 Compact Lime Stone appears the prevailing
rock but it is said Known that
Coal beds and Sand Stone Shale
occur at a little distance from
the river Lime Stone Contained Encrenites

97 Above Franklin 3 Miles after leaving the
bottom they passed some Groves of
small oak trees and bushes and
arrived at the Margin of a wide
Grassy plain apparently as boundless
as the Ocean and which it is
said extends without interuption
300 Miles to Arkansa
Charaton River originates near the
de Moyen River of the Mississipi
Contains extensive Coal Rang
99 Above the Mouth of Grand River
Compact Lime & Argillaceous
Lime stone & indications of Coal
a few feet above the water Elevation
Fort Osage 105 Miles above the
Mouth of Grand River in
107 Latitude North 39 9 33 1/2
See notes by Say 106 for Annual remarks
109 Distance between Fort Osages &
Konzas River 52 Miles
113 150 feet may be assumed as the aggregate
depth of the Valley of the Missouri
for the first 300 Miles above the
114 on the Mississippi Width 3 Miles

125 Kanzas Superstition Original Man Woman

137 In all the Lime Stones along the Missouri We observed a tendency to Chirtoline Structure of Reddish & Yellowish White Colour have some resemblance to Impure Granular Lime stone Horizontal Strata quantity of Organic Remains Connection with the Coal Strata indicate its relation to the Secondary

138 In ascending 120 Miles the Konzas River you approach the Great Sandy Desert which Stretches Eastward of the Rocky Mountains

139 The last Sail is a Margin of 10 to 12 Miles on the Western Side of the Missouri

141 21 Miles above Wolf River is the Grand Nemahaw it rises in the Plains between Platte & the Republican Fork of the Konzas & Runs Eastwardly 150 miles falls into the Missouri N Latitude 40

142 Current of the Missouri 12 feet per second Low Water 6 feet per second High Water 7 20 feet per Minute

* Humbolt Note N.A. Rivers P. N. Vol 5 637 Vol 4 — 452

143 Mouth of the Platte 41 3 13 Labiad N

13 Miles above the Grand Rujs
3/4 Mile of the Bluffs fell down as
noticed by Lewis & Clark. But the
river now has left the Bluffs &
the Medaw is on its place

147 Indian Marriages &
family Matters

Page 2[illegible]4 The Missouri Indians are not
accused even by their Enemys of
Eating human flesh.

217 Beautiful Character of the
Indian Mother family return after an
unsuccessful Hunt

233 Wives Natural Indian trust of
Hospitality in offering their wives
to the bed of the Stranger is
also common with the Nyso
Laplander and the Romans
Spartans and others

234 Punishment of adultery as in
Rome
The master of life

243 Jews & Custom if the deceased
leaves a Brother he takes
the wife

255 Indian Chivalry in 2 Brothers
The desportions of the old
257
267 Power of God or Wakonda
272 The Earth quake that nearly
destroyed New Madrid
was felt in the Mississi
Nations. Superstitions on
the Earthquakes
273 Indians belief that the Master of Life
had a Son Killed by the Big Knives
Man to pa or Great Spirit
276 Annually in July the Minnetarees
perform the Dance of Penitence
like the tortures of the Hindoos
279 Indian Traditions of the discovery of
the Worlds resemblance to the
Mahometan Days to Pentecost
281 Good of the Omawhaw Jewish
Sedurb thursday with White Clay
Not entire the Sack cloth & Ashes
231 The Christian Virtues
232 Hospitality of the Omawhaw
328 Law of inhibition The forbidden
fruit.

328 an Indian Fable a Bull amount a Intoxic

442 Indian Benediction
May the Master of life be your
Protector

445 Population of the Pawnee Villages
according to Pikes Estimate
in 1806 was 6232 out of
Which Number 1,993 were
Braves or Warriors

455 Platte River Compass Variation
13½ degrees East

463 North fork of Platte Rises in the
Rocky Mountains Mistaken
by Pike for the Yellow
Stone

467 Herds of Bison 10000 in sight
at the same moment
Sides Coarse Sand & Gravel

469 Geologist of U S were of opinion
that the Rocky Mountains
were not Primative

470 ~~Heavy~~ Herds of Bison
Blackened the face of the
whole Country

476 Magnetic Variation 14 East

477 The Rockey Mountains may be considered as forming the Shore of that Sea of Sand which is traversed by the Platte and Extends North ward to Mysouri Above the Great Bend
Range of Hills bounding the Platte North & South consist of Granite & Water worn fragments of Granite and other Primitive Rock are based on a Coarse friable Sand Stone of a dark Ivory Colour Cut through by the Platte
This Range may be a Continuation of Black hills Mentioned by Lewis & Clark as Containing the Source of the Shiene
488 Salt Springs on the Platte Country West of the Range of Hills N & S for Several Miles West Uniform plain of Coarse Sand & Imbedded Stones
489 An actual Elevation Considerable Distant View of the Rockey Mountains
490 Mirage Images of Pools of Water in the Deserts of Platte
500 Cannon Ball Creek on a bed of Granite Channell 50 f. 100 feet below the Level of the Country

501 Shelving Sand Stone Rocks in the Castle bounte

503 defile Castle Tributary to the Platte has a course along the Base of the mountain in a narrow defile

at Eleven Encamped at the Base of the mountain the Boundery of a plain of 1000 Miles The wood less plain is terminated by perpendicular rocks of Sand Stone Similar to the Stone of Cannonball Creek (Bituminous) Lumbly a Vast wall parallel with the Base of the Mountain they Emerge at a Great angle of inclination below the allaveal of the plain and rise abruptly to an Elleration of 150 to 200 feet Passing within the last Range we found a Narrow Valley & Seperating it from a Second Range of Sand Stone of Nearly Equal Elevation I observed Resting against the base of a high

Tentative Hall beyond
End of 182 Vol

In this Region of the salt formation it is well to observed that the components of sea Water are

Muriate Soda or Common Salt	180.5
Muriate Magnesia ——	18.3
Muriate Lime ——	5.7
Sulphate Magnesia ——	21.06
Total Grains	226.1 to the

Pint of Water 13.22 Grains less than ½ an ounce to the Pint.
Now when it is remembered that lime is soluble in cold Water in a large proportion and when in the uplift on the Hydrostatic principle the Waters in their passage through the ancient lime Stone dissolved the Lime & the appearance of the exposed ancient rocks, indicate this action of Solution in their roughness of the exterior Portions the Chimical decomposition of the Lime and Sea Water ensued and therefore on the fresh Water Streams in the Salt Region we have Saline Springs and the Lime deposit of the Secondary this extensive deposit in the Basin the Result of Evaporation Double Chimical action of the Salt and Components of the Sea with the Solutions of Lime from the fresh Water forced into the the inland Seas and thus the

[redacted] Annual distinction of the Basin
annuals thus left in the basin
by the retiring floods and thus the
annual deposits both freshwater
and Marine in the Seine deposit
exploding from the Lakes to the
Mediterranean through the whole Valley
of the Mississippi & Missouri and
at the base of the Secondary
formations at the foot of the
Mountains Ranges.

A Curious Calculation can not but strike
the Mind in reflecting upon the quantity
of Salt Contained in the Sea Water and
by Calculating the Capacity of the Basin
of the Mississippi & the different Regions in
which the Salt formation occurs the Number
of Pints Contained in the Basin would
give nearly 180 ÷ Grains Salt per Pint
Now supposing the original Elevation
of Water in the basin to have been
— feet above the Level of the Basin
and Contained — Gallons of Sea Water
the Salt deposit would amount in
the 2nd flood to —— lbs and the
deposit would be found in lime Stone
Region in the Neighbourhood of large
Strata of Lime Stone Water or in such
Situations as indicated Original fresh
Water Rivers beds or Courses

Notes to Vol 2 Longs first Expedition

Page 1 The inclined sand stone of the Base of the Rocky Mountains much wider and its summits incomparably more Elevated than our previous opinion or distant View led us to expect The Extensive sandy Skirting the mountain base like a Vast Rampart and from a person standing near it intercepts the View of the little more grand and imposing features of the Granite Rocks behind it—

It consists of Rocks in which comminuted fragments of (Granite) Pumatere aggregates are intermixed with the Reliquiae (relicts) of animals of a former World known only by the Monuments which these remains exhibit

Page 2nd This formation extends from the [illegible] of this range to the Summit of the Chaines alternating with [illegible] of animal Remains

[illegible] tubed columnar rocks disintegrated

The lowest part of the Sand Stone formation exposed on the Western declivity of the Hills and forms Mount the Grante Contains extensive beds of Conglomerate often of a Reddish Colour

and others in the different strata by pressure upon the Rocks both primitive & transition, & secondary, by entering into the structure of the Rocks by pores in some respects destroys the Cohesion and the Saline Nature of the fluids thus locked in the structure when exposed to the air would elasticity or produce in the Rocks a disposition to crumble and fall into Sands. so often noticed in the accompanying Notes. And here it is as true to demonstration that at a certain depth the pressure of the fluid would not only enter the Structure of the Rocks and destroy Cohesion without the aid of the by distillation pressure in Common Structure would be disposed to assume a more elevated level in the fluid or float in the strata and it is thus [illegible] Communication with Common Strata was effected in the extension of the extensive ranges of Mountains upon the Earth, the receeding strata from the Mountains the deposits and deposited the different strata in as particular Counties Cantons by construction, directed and thus the immense secondary deposits of the

4 Masses of White Sand Stone with the
Black at the Base Columnar

The inclined Sand Stone Secondary 2 Miles
5 wide

The first range of Pinatire Mountains
more abrupt and Rugged than the
Sand hills sides destitute of Vegetation
Rocks agriate of feld spar Hornblend
approaching in Character some of the
Common Varieties of Granite
on the Eastern side the feld spar
predominates it is of a Reddish
Colour Structure Chrystaline
on the West Hornblend predomenates
of Laminated Appearance Cleavage
of Lamina Perpendicular

6 Course of the River Sun from the hights
Below the confluence of three Branches
the River turns S E bursts through
a Chasem in a Vast Mural
Precipice of Naked Columnar Rocks
11 It is the margin of that great formation
of Secondary which occupies the plains
and appears as if broken off by some
Convulsion of Nature & thrown into
inclined Position it is of great thickness
its Lamina in almost Perpendicular Position
occupying a Surface for 15 Miles in extent

Prairies & Low Lands of the Mississippi
& Missouri 4 The Conglomerates at the
foot of the Mountain Ridges tell in the
most Clear and forcible Manner the
direction of the Current thus dashed in the
General flood and as the Secondary
found from the Base of the Rocky
Mountains & thoroughout the whole
Eastern side of the alleghany the
direction of flood from the Lakes
of Lager Western Wall runs up the Wa
alleghany Ridge from the Mou
Southern boundary of the Western wa
upon the whole eastern front of
the Range and the Packering Stone
& Other Conglomerates with the whol
Sec. 14 Were once the Shores of the
immense Receeding Sea that was
not inland as it is supposed but was
subject to the flow and reflow of
ocean as it receeded from to its
Native bed

5. 6. 11 The extent of the inclined Sand Ston
Strata 2 Miles to 3 and Vertical in proportio
assuming Horizontal Strata as it descend
ension the plain and to use the langua
of the Note appears Broken off by some
Great Convulsion of nature and have
is manifest the upheft of the Mountain
Range by the Primative Rocks projecting
through the Cover of the Secondary in
Softened State and Protruding to the

Page

11 We saw many masses of Sand Stone having striking resemblance to Colossal Ruins also some insulated Hills with perpendicular sides and level Summits these seem to be the Remains of extensive Portions of Sand Stone Stratum which formerly covered the County to the level of their highest Mountains They occur at considerable distance from the base of the Mountains & their Summits are composed by Horizontal Strata for a small portion of the upper part of their Elevation their sides are perpendicular but their Bases are covered by an extensive accumulation of Debris sometimes rising to near the Summits

Debris Fragments of Rocks
Ruins Work

12 Resting those peculiar hills (Tabular) which mark the border of the secondary Region we cross a Ridge of secondary Region Sand Stone 300 feet in Height with Shalla inclining West Green Stone

In defile Creek the following formations were found Commencing with the alluvial of the plain on the East

Porcupine height above the surrounding
which underlays its Base and bears
the evident marks of the Bolson
action in the uplift on its western Edge
higher in the Range overlaid by the
Flats Top formation of Volcanic
Origin which has asserted its self
into every Recess & interstice of the
Rocky Range and demonstrates by
its Chrystaline formation its fluid
State and Volcanic Origin

12 It is highly probable in the 200 Sand Stone
The [illegible]

1st Horizontal beds of Sand Stone embracing extensive beds of Coarse conglomerate commonly of a light grey or Reddish ~~ash~~ Yellow Colours

2nd fine compact Gray sand stone containing a few impressions of organic Remains resembling those of the Coal formation This Rock encloses 20 degrees towards the West it forms continuous ranges of Hills not difficult of ascent from the East but the Western declivity is abrupt and precipitous

3 Softly detached Columns of Sand Stone of a Reddish Brown Colour these are irregularly scattered through a woodly Valley some of them Rise 300 feet above the Common level of the plain & are so steep on all sides as to preclude the possibility of ascent others are accessible at some points and these we did ascend Walter Russo with difficulty an Ancient River or in flood

4 Coarse White Conglomerate and Sand Stone of a deep Red Colour attenuating with each other and with beds of fine White Sandstone resting against the Granite in a highly inclined position this Rock Contains Remains of Turbinated Productus

and other Bivalve Shells this Rock
Contains Iron ore in extensive beds
and from its Eastern side flows
a copious Brine Spring.

The Granite (Primitive) succeeds the last
mentioned Sand Stone is of a dark
Redish Brown Colour containing a proportion
of Feldspar of the flesh Coloured
Variety and Black Mica The Chrystaline
Grains of the fragments of Feldspar
are large and detached easily Consequently
the Rock is in a State of Rapid disintegration
Consequence as it is superficial
This Granite Rises abruptly in immense
Mountain Ridges and undoubtedly extends
far to the West (Why not also far North?

From the summit of the Peak the View towards
the North West and South West is diversified
with innumerable Mountains all White
with Snow on some more distant it appears
to extend toward their Bases immediately
under our feet toward the West lay the
the Narrow Valley of the Arkansa
which we could trace running
toward the South West for about 60
Miles To the East Lay the great
Plain Rising as it receded in the
distance until it mingled with the distant
Horizon

31 is two Miles toward the South the Mountain of the Rocky Mountains abruptly 11500 feet Elevation above the level of Ocean in Lat 38.18.9 Long W.G — 105.39.49

Great uniformity was observed in the Character of the Rocks about the upper part of the Mountain it is a compact indestructable Compound of great Feldspar Hornblend in very small particles So that the Formation is Compound of three Substances viz Mica being Formative as the 4th

39 16 July 28 Miles South West to the Arkansa

Late in the afternoon we arrived at the brink of the Precipice that devides the high plain from the Valley of Arkansas it is here Narrow and so deeply sunk in the Horizontal Sand Stone that although there are tres of Considerable growth along the River they do not rise to the Level of the great Plain

42 Sand stone Rock in inclined position with the formation

44 in ascending the Arkansa we found the Rock to become more inclined & of a Redish Colour as we approached the Primitive it is succeeded by Perpendicular Grits

44 Here the Arkansa Runs through a Channel
a deep perfuse in the Gneiss rock which
Rises abruptly on both Sides to such
a hight as to appear an impassable
barrier to all further progress

45 for General appearance of deposit on
the Lanes of plains the grande Basin
Country of the great inland ocean

Waters of the Mountains of Arkansaw
Fore and Barn fount Waters of
the Reas in the plains Backuith

59 Conic Mounds of Sand Stone Containing
Marine animals

The River Valley a Mile wide distant
Bluffs which bound it low & of
Gradual ascent

The Boulders & Pebbles Gravel to abundant
Near the base of the Mountain and
been growing Gradually less prevalent
and diminished in Size & their
place supplied with fine Sand
Mixed with Clay which have Composed
the Surface the Most of the County
Destitute of Vegetation

Encampment 18 Miles above the
fort forks of Arkansa 100 Miles
from the Base of the Mountains

Rise from the River Broken by Gravelly
Ridges since leaving the Arkansa
No wood obliged to use Buffalo Dung
The extensive deposit of Secondary
Horizontal Strata of Red Sand Stone
Must be of Cretaceous / in immense Strata
Varies in Colour from Brick Red
to dark Brown, sometimes Gray &
Yellowish White - it Consists of Rounded
particles of Quartz & other Siliceous Stone
Varying in size from the finest sand
to Granite Stones & Large Pebbles
Extensive beds of Pudding Stone
Occur in many / but of it but are
Abundant in proportion to their
proximity to the Primitive
Mountains Wherever we have met
them in immediate Contact with the
Granite of the Rocky Mountains they
are Nearly destitute of Cement
& of a White Colour

Horizontal
Red Sand Stone formation 250 feet thick
overlaid by Gray Sand Stone 200 feet thick
Estimate that 1500 feet in thickness
in some places of the Gray Variety
Native Bears of the Valley of the
Forks of Platte

The Valley of Arkansas
on the left and before us lay the
splendid plain studded with little
groves of Timber diversified with Vast
Conic Mounds and circular tables
like Hills while Herds of Bison Antilopes
& wild Horses gave a life & Cheerfulness
to the Scene.

A Region displaying an Geological
Character

The High peak at the head of Arkansas
in View at a distance of 130 Miles from
its Base Reference to Pikes Journal
in our Ascendings in the Mountains it
was never out of Sight

We passed in the Morning some tracts of
Grey Sand Stone Heavy Mixt with
Several Conic Hills belonging to that interesting
formation called by Werner the
Floetz Trap Rocks

We had now the prospect of a Country
Varied by Continued Ranges of hills
sixty feet with circular Conical like
Peaks and irregular Masses of every
Variety & Magnitude & Position

Page 80

At noon we halted near the base of a hill of this description it is of Green stone and the same Rock on which we Rest. is disclosed at the bottom of a ravine which commences near the foot of the Hill The table Rock is of Slaty structure and embraces narrow beds of Bituminous Clay Slate which Contains Carbonized remains of Vegitables in very possible Respect resembling Charcoal produced by burnt combustion in the open air We also saw some porphinic Masses with a Base of Green stone Containing Chrystals of feld Spar

81 Crossed a narrow Channel paved with Black & Shapeless Masses of Amygdaloid and imperfect Porphinic Green Stone This is the first Stream we had seen for a long time bounding Rocky of Secondary formation whose waters were Free from the impregnation of Muriate of Soda & other Salts infurnace that it flowed at no great distance through Trap Rocky

82 This Mural Barrier has an Elevation of about 200 feet is impassable except at one place by Ravines a Wall or Barrier

85 The Valley in which we settled is narrow
bounded by cliffs of green stone having
manifestly a tendency to Columnar
Structure or Polyhedral Structure
it falls Readily into large Prismatic
Masses but obstinately resists that
further disintegration which must
take place before it can be removed
by water

85 & 86 The County between the Source
of Pegatory Creek and the Summit
on which we Encamped is a
broad Elevated formation of Trap
Rocks Resting upon Horizontal
Sand Stone Rolled pebbles are
scarcely ever seen except where
the Sand Stone is exposed by the
action of a Current of Water

87 Green Stone formation
Sand Stone Rocks with Indian
Inscription

90 Same Stratta as Pegatory Valley
The basement or Red Sand Stone Rock
Consists almost exclusively of White
Transparent quartz united by Scanty
Cement usually Contains Lime
& Some times but not always oxide
of Iron in Some instances the Cement
Seems to be wanting

Page 30

On entering the Western part of the Valley we
present before us, Mondays October, the
Middle of the plain and commencement
of the Surface of the Sand Stone Table
and apparently in irregular Beds
Rocks the Summit of a Land Scape
of Several Acres Covering the Surface
Trees, Trees in Succession Dwarfs in
Character but more Stunted and
Remarkable. After passing the Land of
these the Hills Come Abruptly and
we enter on a Vast unwooded Plain
of Sand— A Stagnated Pool of
Bitter Nauseous Water More Bitter than
Ocean

Important | In the Midst of one of the Streams we encamped
in passing the last formation we Reached
the point of a long but low Ridge of
Arrayed and Regularly Stratified as
To Suggest to every one of the Party
the Idea that the Rocks had been
once in a fluid State and that
when in that State had formed a Current
descending along the bed of a Narrow
Ravine which it Now Occupies) Conforming
to all the Sinuosities and Irregularities of
the Valley as a Column of Some fluid
Matter would do if Subsequently
penetrated with numerous Regular
Cavities which appeared in Series

instances elongated in the direction of the Ridge & Valleys & usually black and when two Ridges are broken together they exhibit the Shell somewhat like the Foot of a Chimney these appearances are so remarkable that it is not surprising Stone Rocks should be considered of Volcanic Origin

94 & beside Bare Sands Barren land there Water Sand Stone Rocks & Gravel Red River Settlement an Indian Settlement of Red River Ground the Country on Red River & Settlers

114 in many places we found the surface a smooth bed of Stone or Stone Covered with thin incrustations of Salt were Water had flowed from the Red Sand Stone formation The Sand Stone is of a deep Red Colour distinctly Stratified & Jointed in various directions by lines Vertical principally with Stalactites of Lime

128 Inspecting of the Country where Geographically as to be like Savannahs

129 The Red Sand Stone apparently the most extensive of the Ranges Diamond Shows Where it occurs indications of the presence of Magnesia both in Limestone beds of Sulphate of Lime —

P

129 This substance has been found more abundant since we left the Region of the Coast Range at the Gorges of the Rivers it is now to judgement as to be Conspicuous in all the exposed positions of the Land West [illegible] of this Town a distance of Several Miles

132 all the Hills have commonly Conformed that they have Resisted this Evolution & form from the Action of Water

150 In ascending the Hills we found them Capped upon upon a Formation of Sand Stone with the Red Marl of the Salt formation The Hills are higher & More abrupt

150 Western Base of the Black Hills

150 Compact Lime

167 Entire length of the Canadian River 1000 Miles from Source to its Confluence with the Arkansa are 4 formations Cretaceous Trap Coal Shale Limestone & Sandstone

247.8.9 { Bad faith of the United States Government to the Osage Indians Pending the Black Hawk War }

261 Bella Pavil

Hills Clark Gray Mountains Sand Stone
cement of the Potomac 2½ miles above
Hot Springs Extensive beds of Bituminous
Clay Slate indicating the Neighborhood
of Coal Facing the State to the South &
East We found first rocks a Fine
Conglomerate Sand Hills Gravel
Cemented and Loose Sand Stone
Rock & Rock upon Mountains Sandstone
from attentive examinations of
these Rocks they have a Slight inclination
East and of Bituminous Slate in
question have been Respected by
Conglomerate Lime Stone It is highly
probable this rock would have emerged
Near where the Sand Stone appears at
Bella Pavil

274. White River has its Source in the Back
Mountains 94 and 38 North
275 White River is in 16 of Arkansas
Flowing & Arkansas 1120 Miles from its

282 Dist is not probable that a large portion of
the Water falling in Rains upon the
Extensive Plains and of the Rocky
Mountains may Search Beyond the
Base and Passes Soil of the Hill &
Mts the Conglomerate Shallow and
descending Rivers to Southward

Journey in Direction of the General inclination
of the Country although much with the
windings of the creek Journey
Courtney the Secretary Lobo a
Mineral Lake and the Countryside
282 Made to appear in the form of a
large Spring which in the
Course of time removed Sufficient
to the which this Valley Lead is
Supplied it must be for others
to Decende Black River Sources in
The Ozark between 37 & 38 Lon. West
9 to 91 West

282 From this same Lead Streams
Missouri
Big River
St Francis
Black River
Osages
Gasconade
White River
Elevated Ridge running from the confluence
of the Missouri & Mississippi on the E
to the Junction of the Cumberland and
The Cumberland on the W

283 In General direction of these and of
the Ozark Mountains
St Francis River

284 The Swamps on the St Francis are formerly
Effected by earth quake in 1811

Lines at the source of Potomac & Shenandoah
abound in Clay Slate & in Slaty
Petrosilex destitute of organic remains

295 The district in which secondary rocks
only are found in the County
Boundary of the Ohio

{ Source of the Washita Lat 34 15
Ozark Mountains Lon 93 to 94 W

Junction of Sand Stone Ledges in the
Ozark district conform to the
Strata

Vol 2
326 Cape Gradeau Earthquakes so
frequent as not to be of daily
occurrence

The Earthquakes noticed by Humboldt
327 were felt in 1811 May to April 1812
This was the time of those convulsive
agitations in the Valley of the
Mississippi Illinois & Missouri
& the Lakes in the same direction
in Upper Canada and the whole Alleghany
Chain. &c

331 The region explored
occupies a proportion of the immense
Valley situated between the Alleghany

and Rocky Mountains and lies between
the 35 & 42 degrees North and
80 & 106 degrees West Greenwich
500 miles North & South
1300 Miles East & West
The formations transition Secondary
& Alluvial.

Hot Springs of the Washita extending
Northwardly to the Land Mines
Supposed to be Primative by some

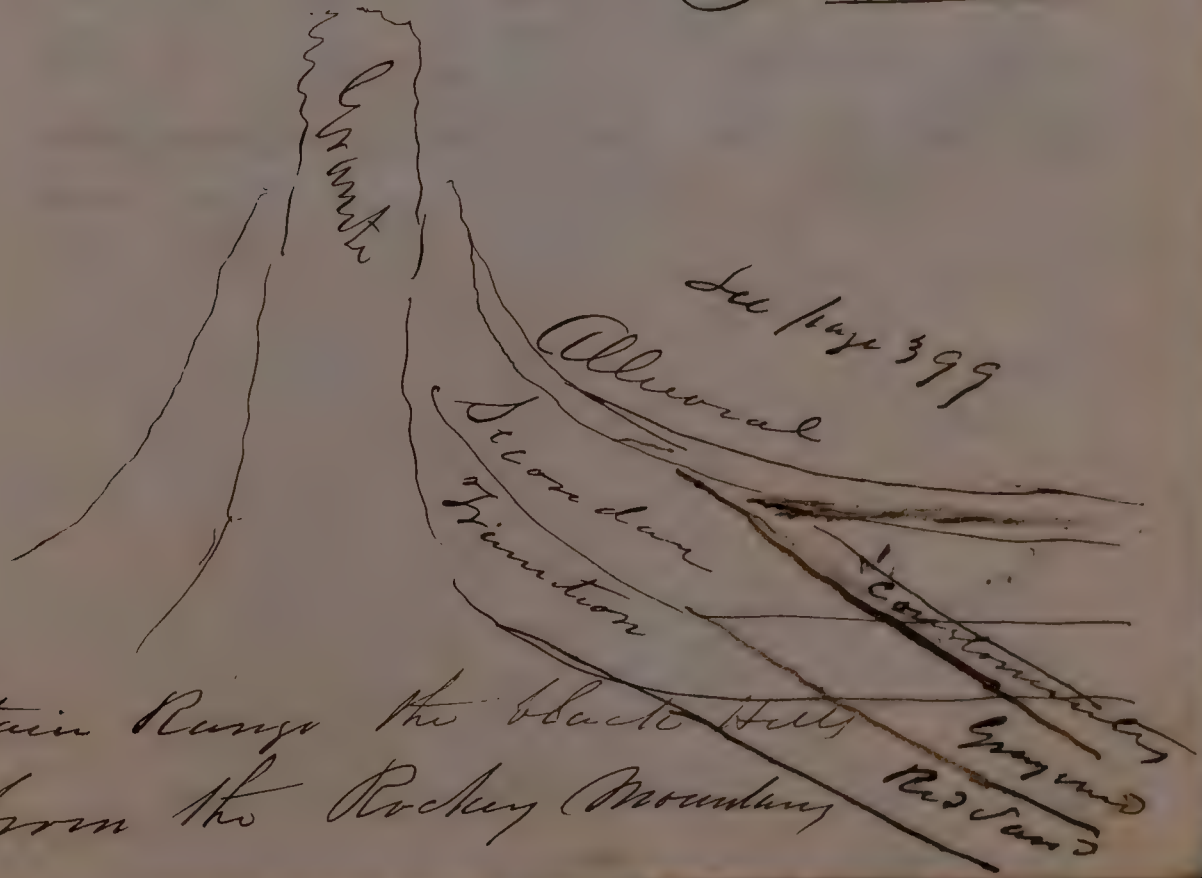
385

Mountain Chains

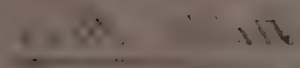
Rocky Mountains from the Settlements
of Canada to the Frozen Ocean
Primative

Low Range of Rocky Hills commencing
near the Confluence of Missouri &
Mississippi Running South West to
the Rio del Norte. Eastward of these
the surface subsides to a plain extending
to the foot of the Alleghanies this last
range of Mountains traverses the
Continent in a direction parallel
with the Atlantic Coast from
the Gulf of St Lawrence to
the confluence of the Alabama
and Tombigbee Rivers [illegible] west
The Alleghanies and the Ozark
Mountains are parallel in direction

and Make an angle of 45 degrees
with the Rocky Mountains
585 In the Ozark Mountains the Granites
and older primative Rocks are found
at the lowest parts & surmounted
by newer formations The newer
Horizontal Sandstones & Strata of
Carboniferous lime stone forming
the highest Summits — Note this
The reverse of this is found in the
Rocky Mountains the Granite there
far surpass all other Rocks both
in extent and Elevation forming the
Central & higher ~~Ranges~~ portions of
the Ridges That range has therefore a
Character very different from the
Ozark and Alleghany this



Mountain Range the Black Hills
Rises from the Rocky Mountains



85 In Latitude 38 North the Eastern base
of the Rocky Mountains is 106 degrees
West longitude following the same
parallel of Latitude Eastward
you come at the Base of the
Ozark Mountains Nearly in Longitude
94 the intervening Space an extent
of 12 degrees is a Steile Plaine
destitute of timber in Latitude
41 No Mountains & Scarce such
Elevation denoting the name of
a hill across between the Western
Spurs of the Alleghany & the
Rocky Mountains

388
389
403 Lime in the amygdaloid
404 Coarse wood undulating the trap
405 Trap Sand Stone Coal Shales
Limes exept Sulphate
are of rare occurrence.

Note particularly Vol 2 from page 389

Section 5 405 Granite Primitive

405 Secondary formation along the Eastern boundary of the Rocky Mountains

1st Red Sandstone Rests immediately on the Granite is rather distinctly Stratified sometimes inclined & some times Horizontal Abounds in Gypsum Salt & Iron but contains No indication of Coal (this I call Transition

Transition

2 Argillaceous Gray Sand Stone Overlays the Red composing 6 & 7 ths of the entire stratum of the State Occupys principally Near the Primitive Contains Coal & Iron

Second

Gum Stone & Gray Stone of imperfect Columnar Structure Resting on the argillaceous Sandy

Amygdaloid ocurs with the Gum Stone

Sand Grant Resting on the Sand Stone and extending over the Great Desert but Rarely found north the top Rock this indicates this recent formation

Rocky Mountains
Visable 160 Miles
In approaching them from the East
as the Curvature subsides Peak after
Peak become Visable (Remember the sea

406 Rocks and aggregate of feldspar
and Hornblend Corresponding
with tranquéon